APPRAISAL OF RURAL WATER SUPPLY AND SANITATION: A CASE STUDY OF SOME SELECTED LOCAL GOVERNMENT AREAS IN KOGI STATE

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(2003/14878EA)

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TO THE

DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR'S OF ENGINEERING (B. ENGR) DEGREE IN AGRICULTURAL AND BIORESOURCES ENGINEERING.

NOVEMBER, 2008

DECLARATION

I, Akawo Omojo Rhoda, declare that this work was done by me and has never been presented elsewhere for the award of a degree. I also hereby relinquish the copyright to the Federal University of Technology, Minna.

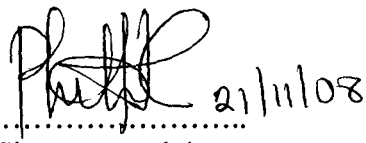
Akawo Omojo Rhoda
.....
Student

.....
Signature and date

CERTIFICATION

This is to certify that this project 'Appraisal on rural water supply and sanitation in kogi state' was carried out by AKAWO OMOJO RHODA under the supervision of MR PETER ADEOYE and submitted to the Department of Agricultural and Bio-resources Engineering, Federal University of Technology Minna. In partial fulfillment of the requirement of the award of bachelor of Engineering (B. ENG) degree in Agricultural and Bio-resources Engineering.

MR PETER ADEOYE
.....
Project Supervisor



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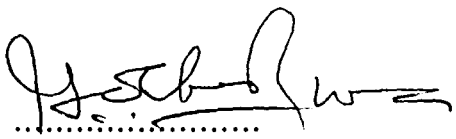
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DEDICATION

I dedicate this project to God Almighty and to the entire member's of Mr. and Mrs. Usman Akawo.

ACKNOWLEDGEMENTS

My profound gratitude goes to God Almighty for His divine grace and favour in these last days.

Also, I want to thank my supervisor, Mr. Peter Adeoye for his understanding, patience and input towards making this project a reality and to all my lecturers in the department thanks for your support. Further, let me specially say a big thank you to the most treasured people in my life that is my family 'I love you all'.

And finally to all my well wishers and classmates I wish you all the best in all your doings.

ABSTRACT

An Appraisal of the various water sources to ascertain the availability and quality was undertaken in some selected local government area in kogi state. Printed questionnaire were employed and personal interviews where means of collecting information. The various sources found in these areas include Streams, Boreholes, Wells and Vendors. Most of these rural dwellers stay a distance away from the source of water and in most cases do not perform any form of water purification before consuming it, which may lead to some form of water borne disease in most cases thereby leading to death or some form of disability. Water borne diseases is mostly found in the rural areas especially the northern part of the country, Nigeria these is so because of the high level of illiteracy found or recorded in the area. The government should create awareness on the danger of not purifying water before consumption and measures to under take to prevent all forms of water borne diseases.

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CHAPTER ONE

INTRODUCTION

Water is essential for a variety of human activities including consumption, sanitation, recreation, the manufacture of industrial goods and the production of food and fibre. In many developing nations, governments often promise a conventional water supply system for both urban and rural dwellers. However, far too many, especially in the rural areas are still without adequate supply of water and there is plenty of evidence of outbreak of water-borne diseases.

More than 60% of the Nigerian populations live in rural areas but only about 42% have some forms of portable water supply with about 20% having piped water supply. The problem of covering of the rural population with the reasonable time is beset with difficulties because of the existing condition such as Scattered nature of villages, inaccessibility and non-availability of other services and lastly but not the less the non-availability of adequate water sources.

Rural community are generally small and poor and hence various limit of schemes have to be necessarily simple and comparatively cheaper requiring the minimum skilled supervision and maintenance which brought about the women's role in rural water supply such as provision of water for general household uses. Water collection can sometimes be a very strenuous exercise, especially when the distance from the source is great and the water is not easily accessible. Moreover, the sources are generally ground water leading to special problems like iron, manganese, fluorides, arsenic, salinity, hardness etc. Ground water contamination could be traced to a variety of activities while contamination sources such as

septic systems are found everywhere; others are regional e.g. saline intrusion. Rural water supply, thus, has its typical problem and requires to be formulated accordingly.

1.1 CONDITIONS FOR WATER SUPPLY

Proposals for rural water supply should consider the feasibility of covering group of villages by a single regional scheme, if they are closely located. This approach is particularly useful in areas prone to endemic form of gastro-intestinal diseases. Some times, water supply schemes for rural areas can be advantageously drawn up, while implementing a water supply scheme for adjoining town and extending the same to the villages that would lie enroute the conveying main to facilitate the use of a raw water source or treated water supply.

1.2 RECOMMENDED DRINKING WATER QUALITY

The quality of water depends upon its origin and history. Natural water shows in general, quality (ies) characteristics of their sources. No two sources of supply are exactly alike and with the exception of some well supplies, even the same sources may produce water of widely varying quality at different times. These variations derived from the opportunities for water to take substances into solution or to carry them in suspension. Climatic, geographic and geologic conditions all play important parts in determining water quality.

1.3 OBJECTIVES OF THE PROJECT

1. To assess the water supply methods in rural areas both in terms of quality and quantity.
2. To assess the sanitary measures being undertaken by Kogi state rural dwellers.
3. To recommend appropriate technological method of improving water supply in the selected areas if there is need.

1.4 PROBLEM STATEMENT

In Nigeria, it's only a gainsaying that water borne diseases are rampant especially in the northern area of the country. This can be attributed to government neglects and low level of literacy of rural dwellers. Though the importance of clean and wholesome water cannot be over emphasized, rural dwellers do not see it this way. This project is aiming at evaluating this peculiar problems and suggesting ways of solving it in future.

1.5 BACKGROUND STUDY

There has been many works and researches on the quality and quantity of water supply to \kogi state. However, not much evaluation has been done on the sanitation aspect of the water being consumed in the rural area of the state. This project is aimed at assessing this and suggests ways of improving it if the water sources are not conformed to world standard.

1.6 SCOPE OF THE PROJECT

1. Not constructing any treatment plant

2. Not facing any government facts but wants to assess what rural people are passing through. By evaluating their water supply potential and making necessary recommendation that will improve the living of Kogi rural dweller.

CHAPTER TWO

LITERATURE REVIEW

2.1 SOURCES OF WATER FOR GENERAL RURAL HOMES

The effectiveness of any source will in the first instance depend on the local rain fall, its pattern through out the year, the evaporation and natural storage available. The most typical sources include.

2.1.1 RAIN AND SNOW

Water vapour condensed in clouds or precipitate as rain or snow high above the earth is practically pure. As rain or snow falls it absorb oxygen, carbon dioxide and other gases from the air, as well as dust, smoke and fumes.

Rain water is soft, saturated with oxygen, but plat to the taste and some what corrosive. Rain water quality depends upon the cleanliness of the catchments area and of the storage and distribution system. Because of its softness and curiosity it should not be brought in contact with lead pipes and containers.

2.1.2 SURFACE WATER

When rain falls upon the earth, part runs off to streams, ponds, lakes or the ocean. The quality of water taken from a surface source depends upon the character and the area of water shed, its geology and topography, the extent and nature of the development by man, time of year and weather conditions. Surface sources in heavily polluted areas are affected by sewage and industrial waste. Surface water can therefore be further classified as;

A. STREAMS

Water flowing in streams consist of direct precipitation run off which has flowed over the surface of the ground, or overflow from lakes and swamps and of water seeping through the ground from the high land to the valleys.

Streams subject to pollution by man or his activity may become highly objectionable because of over-loading with putrescible organic matter between maximum and maximum flows there may be substantial variations in quality.

Soluble minerals are brought into streams not only as a result of run off absorbing such substances from the surface of the soil but as a result of ground.

B. NATURAL PONDS AND LAKES

The water entering ponds and lakes is obviously the same as that in tributary streams. Changes in quality are brought about by the forces of self purification. The extent and characteristics of these changes depend on the size of the body water. In relation to its drainage area, upon its shape and wind currents. They have much more uniform quality that that taken from streams.

Ponds and small lakes suffer from spring and fall over turns", which bring about a temporary stirring up of bottom sediment.

C. IMPOUNDED RESERVOIR

The valleys cut by streams, are subjected to much the same conditions as in natural ponds and lakes. Normally the best quality of water will be found at about mid-depth. Top waters are prone to develop algae, while the bottom may be high in carbon-dioxide, iron, manganese and occasionally hydrogen sulphide.

2.1.3 GROUND WATER

This are part of the rain which falls upon the surface of the earth, then percolates into the ground to form ground water during percolation the water comes in contact with many substances both organic and in organic some are readily soluble in water causing alkalinity and hardness, and soluble water containing carbon dioxide absorbed from the air or decomposing organic matter in the soil.

The sanitary condition in the vicinity of ground water sources are important, particularly where sub-surface pollution may be derived from privy pits, leaching cesspools, and leaking sewers.

Generally ground water are clear, cold, colourless and harder than the surface waters it can further be classified as;

A. SPRINGS

Ground water moving along the upper plane of an impervious stratum comes to the surface as a spring. This is likely to occur when the impervious stratum outcrops below an up area of previous materials. In general, their quality characteristics reflect the geologic formation of the locality in which they occur.

Certain springs, some times discharge hot water due to the presence of sulphur in them. These sulphur mixed water (hot or boiling) cannot be used as the source for water supply, but sometimes useful for taking dips for cure of certain skin diseases.

B. SHALLOW WELLS AND INFILTRATION GALLERIES

Shallow wells are those developed in surface deposits of previous materials overlying an impervious stratum. Shallow wells may be large diameter dug wells or small diameter driven wells.

In-filtration galleries like shallow wells are developed in shallow water bearing strata adjacent to springs or ponds. Water from gallery and shallow wells posses the same characteristic.

Infiltration wells are similar to that of infiltration galleries and they are underground structure, and instead of constructing them in form of long trenches, they are constructed in form of wells generally used for collecting ground water not necessarily river water alone.

C. DEEP WELLS

Deep wells are either driven or drilled; depending on the strata encountered most times they penetrate impervious strata before reaching the water-bearing strata desired.

Generally the gathering ground for deep wells is extensive; this means that ground water will have long paths of travel and long time of contact with the rock and soil formation. Deep well waters are usually clean and colourless but often contain iron or manganese or both. Some deep wells are high in carbon-dioxide, contains high amount of hydrogen sulphide and some may contain mineral salts such as chloride, sulphates and carbonate which render treatment difficult.

D. ARTESIAN WELLS

Sometimes the geological formation of an aquifer may be such that is acts as a pressure tube, because the hydraulic line goes above some part of the aquifer when the pressure in the produced water is some times high very high its may cause the water to rise up. Some above the ground this condition is known as artesian condition and if a well is constructed for the purpose of water supply that well be called ARTESIAN WELL.

2.2 SELECTION OF A SOURCE

When more than one possible source is available the choice should be made in order of priorities: firstly, the reliability of the source, secondly, its purity and lastly, the ease with which it can be supplied to the consumers. If a large supply is being planned from an unexploited source, the services of an analytical laboratory should be employed to assess the quality and advice on necessary treatment.

Natural bodies of water of most kinds are not uniform; they vary in composition from place to place, from time to time in the course of a day, and from season to season. When taking water samples for examination, care should be taken to ensure that the samples represent the body of water as much as possible. Sample should be analyzed without delay as they are liable to certain biological and chemical changes if kept for long period at normal temperature.

Therefore, sources of water supply can be categorized in different forms which are

i) Water that requires no treatment except disinfection to meet the water quality standard and could be supplied by gravity e.g. springs and streams in protected drainage areas as in hilly terrains

ii) Water that requires no treatment except disinfection to meet the water quality standard but would require pumping e.g. wells, tube-wells, infiltration galleries.

iii) Water that requires simple treatment like plain sedimentation slow sand filtration or a combination of these two but would require pumping.

iv). Water that requires special treatments like sedimentation coagulation, rapid sand filtration and could be supplied by gravity

v) Water that requires special treatments as mentioned above but would required pumping also.

2.3 WATER QUALITY AND QUANTITY

2.3.1 WATER QUALITY

The quality of water depends upon its origin and history. Natural waters show in general qualities characteristics of their sources. Many factors however, produce variations in the quantity of waters obtained from the same type of sources. No two sources of supply are exactly a like and with the exception of some well supplies, even the same source may produce water of widely varying qualify at different times. These variations derive from the opportunities for water to take substances into solution or to carry them in suspension.

Climatic, geographic and geologic conditions all play important parts in determining water quality. The quality of water is also determined by physical, chemical and bacteriological tests which has been discussed in recommended drinking water quality" on the basis of these tests, results sources of water can be divided into four different classes.

Class I: Source of this standard is the best available is nature and does not require any other treatment except disinfection. This is known as highly satisfactory source of water and many deep wells water comes under this category.

Class II: This is categorized as satisfactory standard and will required treatment like filtration and disinfection only. Water from shallow wells, springs, and lakes may come in this category.

Class III: This is also classified as specious water source. These waters require treatment like coagulation, filtration, sometimes special and followed by filtration.

Class IV: This is the unsatisfactory type of water source. This water may contain toxic substances or highly polluted with sewage and industrial wasters. This cannot be purified by the normal treatment used for water supply and never taken up as a water supply source.

IMPACT OF WATER QUALITY

Water is never "pure" is a chemical sense. It contains impurities of various kinds both dissolved and suspended impurities. These comprise

i) Dissolved gases e.g. hydrogen sulphide, carbon dioxide, ammonia, and nitrogen:

ii) Dissolve minerals e.g. salts of calcium, magnesium and sodium

iii) Suspended impurities e.g. Clay, silt, sand, and mud.

iv) Microscopic plants and animals

These are "Natural impurities" derived from the atmosphere, catchments area and the soil. A more serious aspect of water pollution is that caused by human activity man's health may be affected by the ingestion of contaminated water either directly or through food; and by use of contaminated water for purpose of personal hygiene and recreation. The hazards of water pollution may be classified into two broad groups which are biological and chemical hazards.

1. BIOLOGICAL HAZARDS: - These comprise the classical water borne disease caused by the presence of an infective agent or an aquatic host as water. The health status of an individual a community or a nation is determined by the interplay and integration of two ecological universe internal environment of man himself and the external environment which surround him. In the modern concept, from an ecological point of new disease is defined as maladjustments of human organism to the environment". The key to the nation occurrence, preventive and control of disease lies in the environment. As such as an

engineer have lot to deal in order to control the environments which in turn control the disease.

2. CHEMICAL HAZARDS: - chemical pollutants of diverse nature derived from industrial and agricultural waste are increasingly finding their way into public water supply. These pollutants includes detergent solvents cyanides, heavy metals, minerals and organic acids, nitrogenous substances blenching agents, dyes, pigments sulphides, ammonia, toxic and biocidal organic compounds of great variety. Chemical pollutants may affect man's health not only directly, but also indirectly by accumulating on aquatic life (e.g. fish) used as human food.

2.3.2 QUANTITY OF YIELD

The quantity of water available from a source is its yield. It is expressed in different units e.g. hectare-meter per day or cubic meter per second etc. The quantity of water is measured by various methods depending upon the nature of the source. i.e. ground water or surface source also upon the information available.

The quantity of a ground water source is determined by the following methods.

1. Practical experiment:- There are two different ways of measuring yield by practical methods.

(a) Direct pumping (b) Recuperating test

(a) Direct pumping:- The water is extracted from the well at a constant rate against a fixed permissible draw-down so that steady equilibrium condition is reached. The testing should be carried out for prolonged period and the steady condition of discharged and water level should persist this particular discharge is now stated to be the "yield of the well", for that particular draw-down.

(b) Recuperating Test:- The direct pumping method gives the yield of a well against a particular fixed draw-down. Some times it is found to be difficult to adjust rate of pumping against a constant well water level. By recuperating test this problem is overcome moreover the yields of a well at different draw-down can be determined. In this one and the static water level in a well is lowered down by heavy rate of pumping. The pumping is then stopped. The water level in the well will start rising. The rises in water levels at different intervals of time are then recorded.

2. Theoretical Method:- In this method the depth of the well penetrated into the aquifer and the diameter of the well are determined from this the area of the well in contact with the aquifer is found out. Then, the velocity of the ground water approaching the well is theoretically determined by applying Darcy's equation as given below.

$$V = K.S$$

Where V= face velocity of water entering into well.

S= Slope of the hydraulic gradient.

K= Coefficient of permeability which has a dimension of velocity.

On applying Darcy's equation the discharge

Q can be determined as $Q = A \times V = A \times K \times S$.

After knowing the hydraulics gradient of ground water of the aquifer and finding the valve of permeability constant, the discharge can be theoretically determined. But as actual finding these valves are extremely theoretical method has a very little practice application.

3. Combined Theoretical and Practical Method

In this method, some relationship is established between the observed valves of static water depth, draw-down and discharge on the basis of theoretical method as given by Darcy.

For measuring the quantity of a surface source the method deputed are:

1) Stream gauging

2) Cross-section velocity method

3) Chemical method:- In this method, a chemical salt of known concentration is fed at a point in the surface stream at a constant rate and the water in the stream is tested at some down-stream point for knowing the concentration of the above chemical. In some cases, the chimerical salt is replaced by some suitable radio- isotopes.

4) Radiological method.

2.4 WATER BORNE DISEASES

Man's health may be affected by the ingestion of contaminated water either directly or through food, and by the use of contaminated water for the purpose of personal hygiene and recreation. The hazards of water pollution may be classified as either the Biological or Chemical hazards. The biological hazards are those comprises of the classical water-borne diseases which are caused either by presence of an infective agent or by an aquatic host in water.

1. Those caused by the presence of an infective agent are

a. **VIRAL:** Which causes viral hepatitis or poliomyelitis

b. **BACTERIAL:** This causes cholera, typhoid, paratyphoid,

Bacillary dysentery, gastroenteritis, infantile diarrhea, and tularemia which are rare.

c. **PROTOZOAL:** which causes Amoebiasis and giardiasis.

d. **HELIMINTHIC:** This causes roundworm, whipworm, thread-Worm and hychated diseases.

e. **LEPTOSPRIAL:** they cause or transmit Weil's diseases.

2. Those due to the presence of an aquatic host are

a. **CYCLOPS:** This causes Guinea worm

b. **FISH:** which cause or transmit flukes and tape worms

c. **SNAIL:** they cause schistosomiasis.

2.5 SAFE AND WHOLESOME WATER

Water intended for human consumption should be not only "safe" but also "wholesome". Safe water is one that control harm to the consumer, even when ingested over a prolonged period-water may be safe, but if it has an unpleasant taste or appearance it may drive the consumer to other, less safe, sources. Drinking water, therefore, should be not only completely safe but agreeable to use or wholesome; such a supply may be turned "Acceptable" or "potable". Safe and wholesome water is defined as water which is:

(i) Free from pathogenic agents;

(ii) Free from harmful chemical substances;

(iii) Pleasant to the taste and usable for domestic purposes.

Water is said to be contaminated when it contains infective and parasitic agents, poisons, chemical substances, industrial or other water or sewage. The term polluted water is synonymous with contamination and the results of human activities.

2.6 METHOD OF WATER TREATMENT

The aim of water treatment is to produce and maintain water that is hygienically safe, aesthetically attractive and palatable, in an economical manner. To improve the quality of water it involves the addition to, subtraction from or chemical changes in raw water. The most common treatments are:

1 For excessive mineral content, hardness in particular.

2 For acidity.

3 For objectionable odors.

4 For sediment removal.

5 For contamination.

The various methods or operations involved in the treatment of water are as follows:

1. Sedimentation which is further divided into:
   (a) Plain sedimentation
   (b) Sedimentation with coagulation
2. Filtration (Slow sand, rapid sand and pressure filtration).
3. Disinfection
4. Aeration
5. Softening

6. Miscellaneous operations such as fluoridation and defluridation, recarbonation, liming, desalination etc.

For the purpose of this write up, the following methods are mostly used in the rural areas they are:

i The physical treatment methods

ii The chemical treatment method.

2.6.1 PHYSICAL TREATMENT METHODS: Includes

1 Screening:- This is done to remove large floating and suspended debris like logs and branches from the water. It may be done with coarse screen in micros copious. Because, clogging of the screen occurs rapidly the mesh is washed continually with high pressure sprays.

2 Aeration:- This is a form of gas transfer and it is used for the variation of operations concluding the following:

a Addition of O_2 to oxidize dissolves iron and manganese.

b Removal of carbondioxide.

c Removal of hydrogen sulphide.

d Removal of volatiles oils and similar odour and taste producing substances released by taste producing substances released by algae and similar micro-organisms.

This is accomplished either by exposing the water to air or by

Introducing air into the water. They are four principle types of aeration which are:

a) Gravity aeration (b) Spray or fountain aeration (c) Injection diffusers

(d) Mechanical aeration

3. **Flocculation:-** when coagulating, chemicals are added to water containing turbidity, flocculants precipitation must be done for up to 5 minutes period. This makes the particle to clog together and have settable size. Flocculation can be done with slowly rotating paddles.

4. **Sedimentation:-** The rate of setting of a particle in water density of water and also the size, shape, and specific gravity of the particles. Water purification by sedimentation is to provide condition so that the suspended materials in water can settle out. Detention periods ranging from 1 to 10 hr with proper design shallow basin will give good performance for rectangular basin, a width of 10m is common.

5. **Filtration:-** is the passage of the water through a sand bed which will retain the suspended solids. The usual filter consists of a layer of sand and crushed coal, supported on a bed of gravel. When water passes through the filter, suspended particles come in contact with the sand grain and adhere to them. This reduces the size of the water passage and a stracing action results, more and more flocs block the water passage and the hydraulic head pass through the bed becomes excessive. The filter is then backwashed to remove the trapped materials.

2.6.2 CHEMICAL TREATMENT METHOD

1. Coagulation:- In this method chemicals called coagulants are added to raw water and thoroughly mixed with it, which causes an insoluble, flocculant precipitate called floc to be formed. The process of adding a coagulant to raw water and mixing it thoroughly is known as coagulation, and the process of formation of floc is known as flocculation. The most commonly used coagulant is alum [Al $(SO_4)_3$. $18H_2O$] which react with the alkalinity in water to form an aluminium hydroxide floc, according to the equation.

$Al_2(SO_4)_3 . 18H_2O + 3Ca(HCO_3)_2 \rightleftharpoons 3C\,aSO_4 + 2Al(OH_3) +$

$6CO_2 + 18H_2O.$

2. Disinfection:- more than 50% of pathogens in water will die within 2 days and 90% will die by the end of 1 week. However, a few pathogens may survive for 2 years or longer making disinfection necessary. The principal means of disinfection involves the use of chlorine, oxone and ultraviolet radiation

$Cl_2 + H_2O \longrightarrow HOCl + Cl^- + H^+$

The amount of chlorine should not be more than 0.2g/l

3. Precipitation: The removal of hydrogen from water is not essential to make the water safe. It may only reduce soap consumption and lower the maintainance cost of plumbing fixtures. The low basic methods are lime-soda process and the ion exchange process i.e.

$Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3 + 2H_2O$

4. Adsorption: This is the process of collecting soluble interface that are in solution on a surface interface. The interface can be between the liquid and a gas, a solid or another liquid.

5. Oxidation: This is a process in which the oxidation state of a substance is increased by means of a chemical reaction. In water treatment, oxidation is used to convert undesirable chemical species to species that are not harmful.

E.g. $2Fe^{2+} + Cl_2 \rightleftharpoons Fe^{3+} + Cl^-$

2.7 WOMEN'S ROLE IN RURAL WATER SUPPLY AND DEVELOPMENT

Since the onset of traditional African societies, domestic activities such as the provision of water for general household use, have been delegated to the women of the community. It is unusual to find men engaged in such activities. Water purification involves the various treatments performed on raw water from its initial collection to making it potable. In the general sense, development refers to changes aimed at transforming the living conditions of people. It is a complex phenomenon, comprising economic, social and political aspects. Dennis (1976) identified two major components of development as the increase in productivity promoted by the use of new techniques and a reflection of the increased productivity by improved life-styles of the people. In this regard, water development may include activities aimed at reducing or totally eliminating the drudgery involved in the search and collection of water, and probably the act of keeping the cost of the water down to affordable levels. These processes must involve the development of a technology that can be easily operated and maintained by the beneficiaries.

The existing knowledge of a woman's role, particularly with regard to water resources development is scanty. The reports produced by Bo setup (1970) and the activities initiated during the United Nations' Decade on Women (1975-1985) have underscored the need for greater attention to be paid to women's issues. Makinde-Adebusoye (1985) observed that the under-reporting of women's activities in development is due mainly to the difficulties in measuring their work. They are often involved in multiple occupations that tend to be practical, private and voluntary. The need to provide a satisfactory estimate of the economic activities of women calls for an assessment of all

activities both in the wage and non-wage earning sectors. This study attempts to assess the role of Nigerian women with regard to rural water supply, its purification and development; to identify new trends as well as the constraints imposed on women involved in rural water supply schemes; to assess the equipment used and the technology available to women for water purification; and to examine women's overall access to recourses, such as capital Labour and material, and their effects of rural water schemes. The present study also aims at using these observations and deductions to recommend strategies for improving women's participation in rural water supply scheme.

In most Nigeria communities, the collection of water, whether from rivers, lakes, springs, wells, rain-water, ponds or other sources, has always been regarded as the responsibility of women. One major factor responsible for this development is that the men often leave their families in the rural areas whilst in search of money-earning occupation in the urban centers (Getechah, 1980). Sixty-three percent of households in a Nigeria country were surveyed as headed by women, due to the migration of the men into towns and cities in search of salaried jobs (FAO, 1984). Nkom (1990) reported that the distributive trade in Nigeria would cease without the active and enterprising involvement of women. A United Nations Children's Fund survey (UNICEF, 1977) had earlier revealed that development programmes which did not involve women failed to realize their full objectives.

Water collection can sometimes be a very strenuous exercise, especially when the distance from the water source is great and the water is not easily accessible. A single collection exercise can last for several hours, or in some cases, a whole day. Such demands might be responsible for women spear-heading many of the efforts to bring water close to the house and to improve its quality In Kano State, Nigeria, several villages have been

provided with piped fresh-water supplies from boreholes operated by electric generators. Although this project was entirely financed by the Federal Government, Hofkes, (1984) noted that is was the womenfolk of that area in their unrelenting efforts to obtain potable water both close to their homes and for use in college industries, who spurred the government into action.

Community participation in creating a water supply plays significant role in developing and increasing community awareness, instilling a sense of responsibility and pride of ownership. Communities, and especially the women, are normally encouraged to participate fully in the planning, construction, operation and maintenance phases of rural water supply projects. The major share of money raised for self-help community water development projects was also acknowledged to have been by women.

Water may be of potable standard either as a result of judicious selection of the source or by purification after collection. Women in rural areas perform various water purification processes, of which removal of sediment is the simplest. Although disinfection by boiling is sometimes done. Oluwande (1983) observed that the quantity of water subjected to heat treatment is usually small when compared with the total amount of water needed by a household for domestic and other uses, initially, water which is drawn may be reasonably acceptable and potable at source, but due to poor and unclean storage, it usually becomes contaminated (Haile, 1980). Frequently the same cup is used for scooping and drinking, especially where the water source is a spring or pond.

Although women in developing countries are making a substantial contribution to water development, there remains a lot of room for improvement. This study attempts to

evaluate the influence and participation of women in the various aspects of providing rural water supplies in Nigeria.

2.8 RURAL SANITATION

The dictionary meaning of the word sanitation is "the science of safe guarding health". The WHO defines environment sanitation as "the control of all those factors in mans physical environment, which exercise or may exercise a deleterious effect on his physical development health and survival".

In the past, sanitation was centered on the sanitary disposal of human excreta. Even now, to many people sanitation still means the construction of latrine. In actual fact, the term sanitation covers the whole field in controlling the environment with a view to prevent disease and promote health.

Elaborate sewage system is not financially viable proposition for the disposal of human excreta in rural areas. For that reason, different types of privies are in use for collection and disposal of sanitary wastes in rural rea, with low cost sanitation.

Privies are so-called because they provide privacy during defecation. Their name does not indicate their more important purpose of disposing of human excreta in safe, clean and aesthetically more acceptable fashion.

The types of privies that may be adopted for rural sanitation schemes are:

a. Bore-hole latrines.

In a bore-hole latrine, a hole usually not less than 450mm in diameter and 4 meter deep is constructed. The hole generally penetrates into the ground water table. This permits anaerobic digestion of faecal solids and longer use of the pit.

CHAPTER THREE

MATERIAL AND METHODOLOGY

3.1 BRIEF HISTORY ON KOGI STATE

Kogi state was cared out of Benue and Kwara states on the 27th August 1991 by then Head of state, General Ibrahim Badamosi Babangida.

Kogi state is the most centrally located of all the states of the federation; it is popularly called the confluence state due to the fact that the confluence of Rivers Niger and Benue occurs there. Its capital is Lokoja, with a land mass occupying 29,833km^2 and a population of 3,595,759(2005 est.) ranking 24th in Nigeria. The state has three main ethnic groups namely IGALA, EBIRA and OKUN, with the Igalas being the largest ethnic group in the state.

Kogi state shares common boundaries with Niger, Kwara, Nassarawa, and Federal Capital Territory to the North, to the east the state is bounded by Benue and Enugu states, to the south by Enugu and Anambra states and to the west by Ondo, Ekiti, and Edo state. The state has 21 local government areas out of 774 local government area of Nigeria. The indigenes area predominately farmers and the state is richly blessed with mineral resources such as Coal which is found in okaba, Ogboyaba and Konton-karfi, Limestone and Marble deposits are found in Ajaokuta, Jakura, Ososo and Osara, while Cassiterito, Columbite and tantalite are found in Egba, Gold is also found in Isanlu in East Yagba L.G.A while Iron ore can be found at Itakpe and Okene. (Giant in the tropics vol. 2).

3.2 WATER SUPPLY

Lokoja waterworks, Ekuku dam's water treatment plant at Okene and Idah township waterworks have been commissioned. There are other waterworks at Ankpa, Dekina,

Oboroke, Aiyetoro-gbede, and Koton-karfe. DFRRI has rehabitated 22 rural water supply schemes and 15 water points in the state. But these are not adequate for the needs of the people in the state. These not withstanding, water supply is a critical problem in the young state.

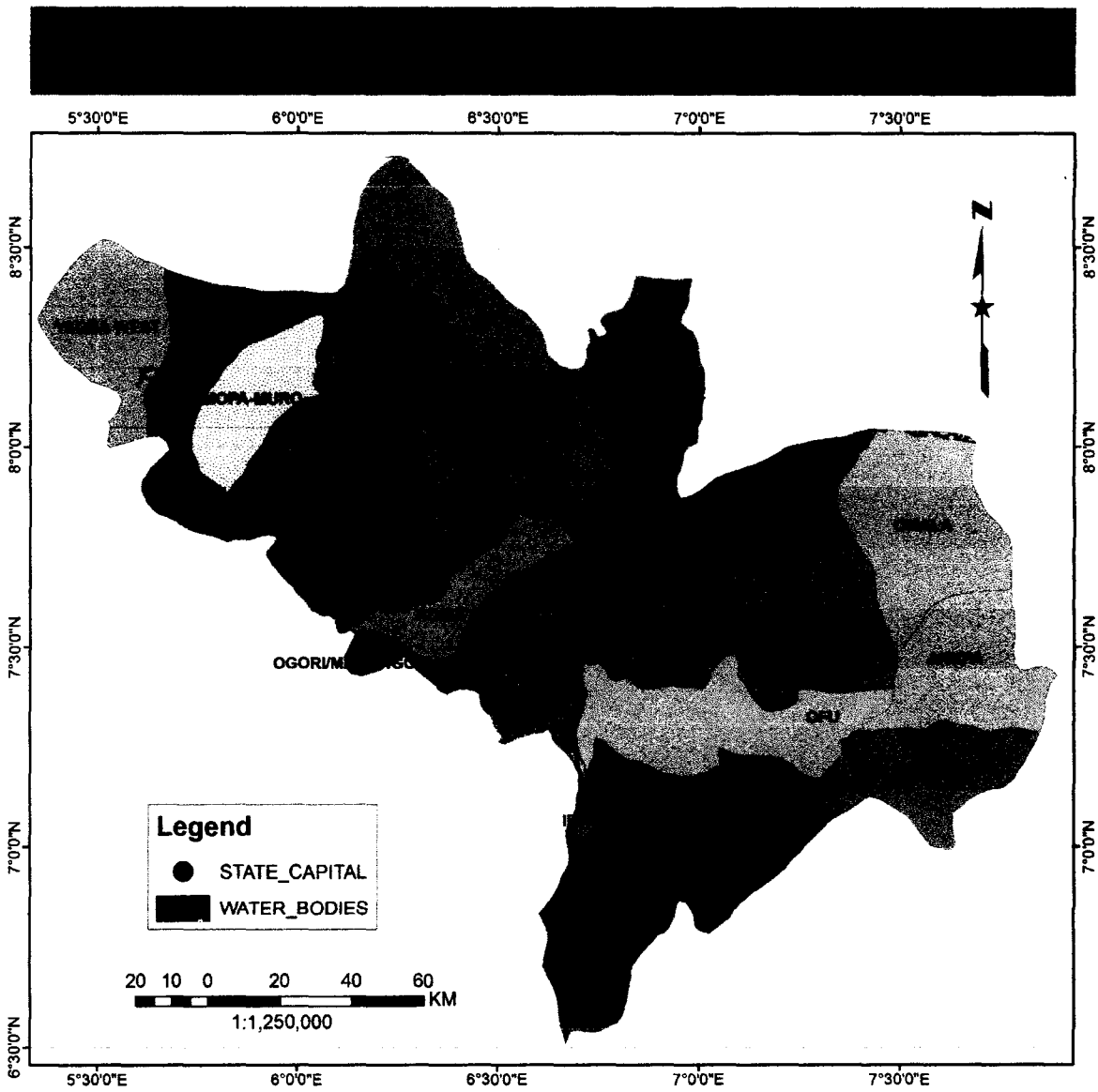

Figure 1 Map of Kogi state

3.3 ABOUT THE QUESTIONNAIRE

From the appendix, the questionnaire consist of twenty (20) question which include the various methods of water sources, it quality and quantity, their mode of purification, distance of water source to their homes, time involved in a trip and containers they used in getting this water from it source to their homes. The questionnaire was a closed ended questionnaire in such a way that most questionnaires filled were done by me because most of the people investigated was illiterate; pictures were taken and personal interviews were also conducted.

CHAPTER FOUR

DISCUSSION OF RESULT

4.1 ANALYSIS OF THE QUESTIONNAIRE

Figure 1 shows the result of various investigations made on the methods of water sources in some villages in Kogi State. The different methods of water sources were observed and analyzed. The analysis shows that bore hole water is mostly used in Kogi state, this is good because it conforms with the WHO/NAFDAC recommendation of drinking water; but the distance from this bore hole to their various homes is of a distance and bucket are mostly used for the fetching of this water which means before getting home some particles of dirt and micro organism must have find their ways into the water thereby contaminating the water leading to some form of water borne diseases like cholera. It is therefore advised that more boreholes should be constructed and those available should be properly maintained to avoid any form of breakdown.

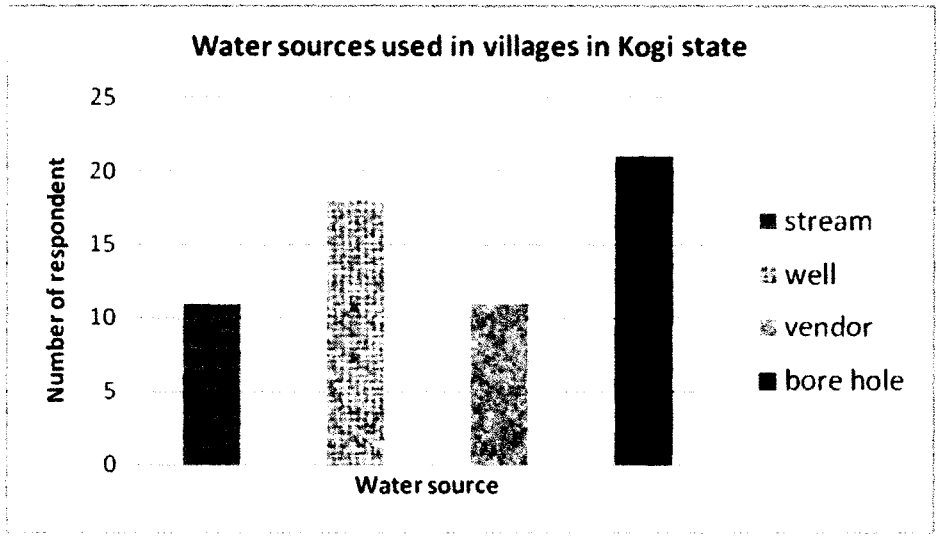

Figure 2. Water Sources Used in Villages in Kogi State

Figure 3 shows the reason for the rural dwellers choosing the source of water they use. The grapy shows that most people do, because it is their only means of water supply but naturally one will think quality is to be greater, proximity, quantity and only choice should not be considered but revise is the case. In most villages streams and wells are used which do not conform to the WHO/NAFDAC approval of drinking water. In such villages bore hole should be constructed so as to prevent to some extent the rate of water borne diseases and they should be thought on the prevention of water borne disease and also be provided with a water purifying plant.

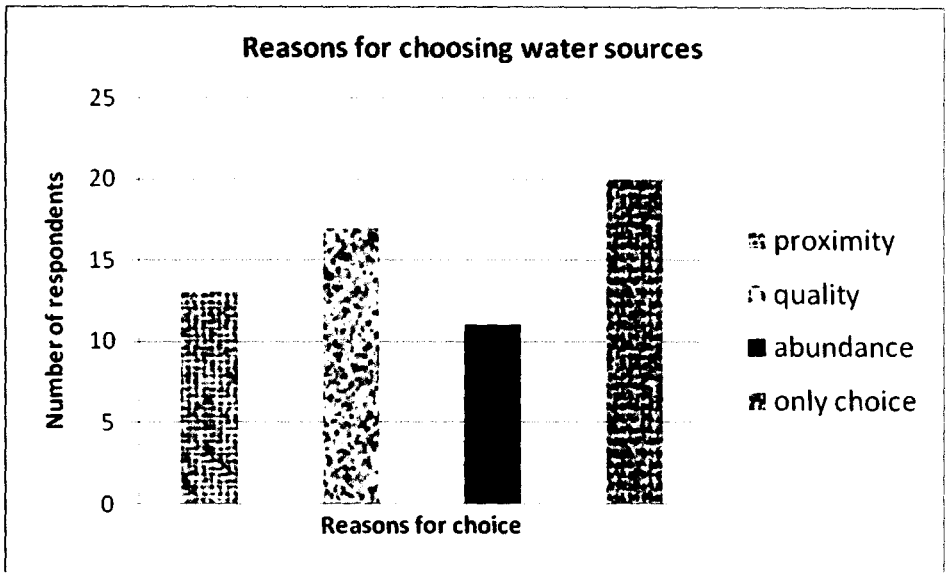

Figure 3. Reasons for Choosing Water Sources

Figure 4 shows the people involved mostly in the fetching of water. The chart indicates that the young women are mostly involved in this activity thereby bringing the role of women in rural water supply to play. Children were also involved in the fetching of water, but hygienically it is not suppose to be, because they will start playing on their way thereby neglecting the fact that the water needs to be clean. It is therefore advised that instead of the children, the young men should mostly be involved in fetching of water to avoid any form of disease due to carelessness from the children's part.

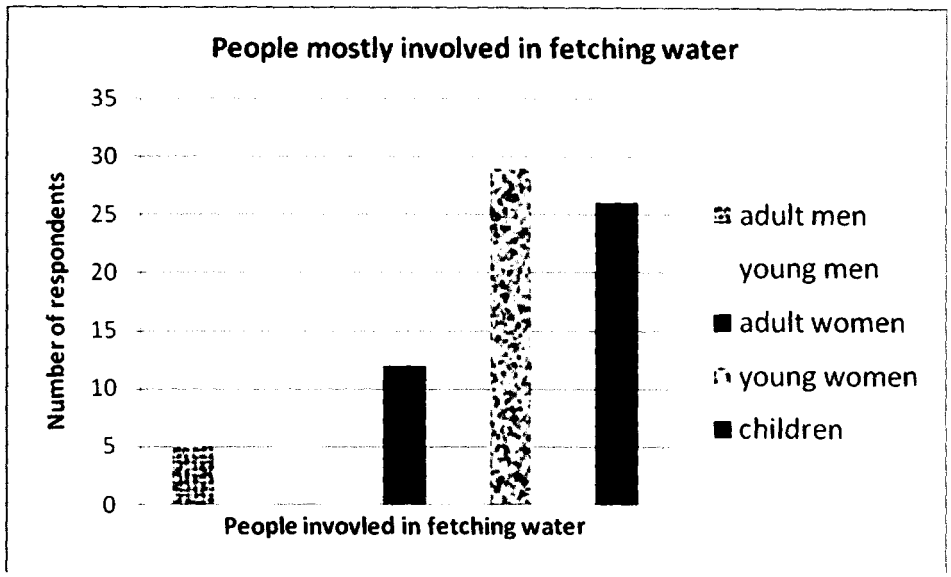

Figure 4. People Mostly Involved in Fetching Water

Figure 5 shows the various methods of water purification done or followed by the rural dwellers. The chart shows that they do not involve in any form of purification at most time which is not really proper in the case of those using stream or vendor or even well water, at least boiling method should be adhere to so as to kill all living organisms in the water thereby making it safer and wholesome for dinking .But for those using borehole water it is the best because it conforms with the WHO standard of drinking water. Therefore in such places where streams and wells are being used, the government should make provisions for boreholes and they should be informed about the danger of using stream or well water without adhering to any form of water purification.

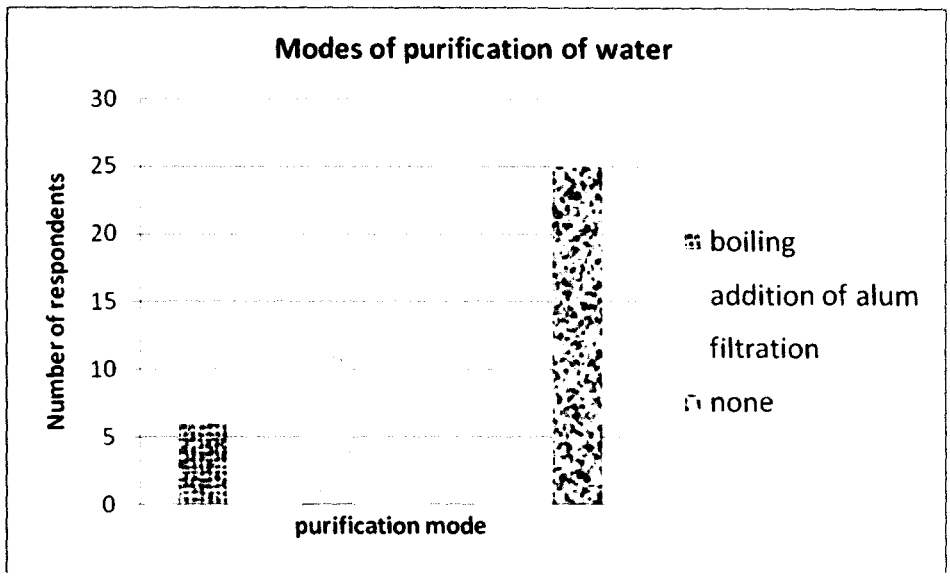

Figure 5 Modes of Purification.

Figure 6 shows the type of containers mostly used in the fetching of water. The chart indicates that buckets are mostly used and most buckets do not have cover thereby exposing the water to some form of micro-organism. It is therefore advice that jerry-cans should be used in fetching the water to avoid flying particles and they should be properly washed before using it to get water.

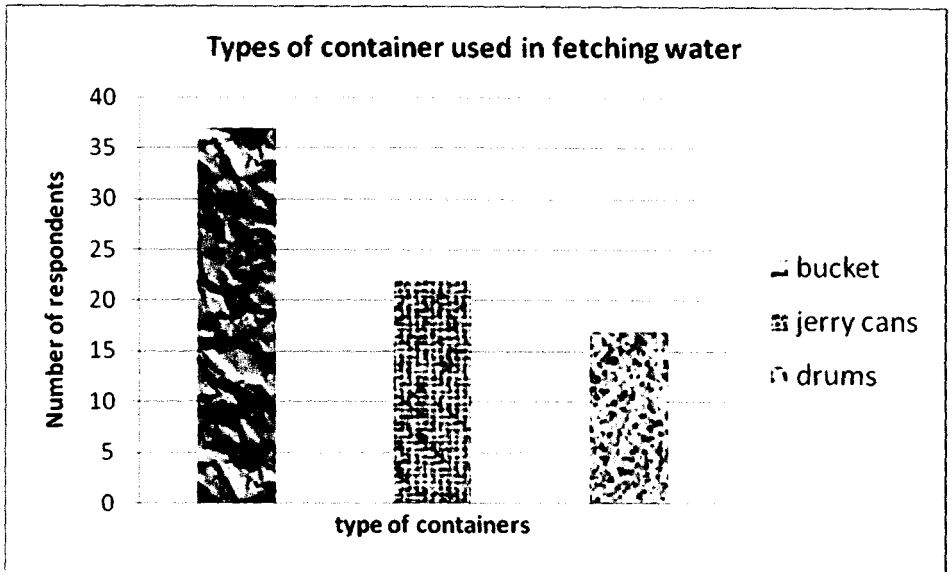

Figure 5 Types of Containers Used in Fetching Water.

4.2 PERSONAL ASSESSMENT

From the assessment, Most of their water sources are not hygienically alright. For instance, there are cases of uncovered wells (plate 1) and where they are covered, people use different fetchers (plate2). It was recommended that one fetcher be allocated to a covered well and chlorination should be done periodically. Also, in some villages, stagnant streams (plate3) were being used for domestic activities. One water sources is being used for drinking washing and even fishing (plate4). Although, there is provision of tap water in some local governments, the containers used by the water vendors (Plate 5) that are taking them to the consumer looked dirty and may be a source of contamination. Also, there are places where women use uncovered containers over a long distance (plate 6)

Plate 1: Uncovered Well

Plate 2: Covered well, different Fetcher

Plate 3: Stagnant Steam

Plate 4: Fishing activities

Plate 5: Water Vendors

Plate 6: Uncovered containers

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The rate of Illiteracy in our rural areas is something that has to be dealt with seriously in terms of purification of water before consumption because from the charts drawn most people do not engage in any form of water purification, most use bucket, and the distance from the source to their homes is not encouraging at all.

5.2 RECOMMENDATION

It was observed that most wells do not have apron that will prevent erosion or water runoff from getting into the well and that people do come with their own fetcher which is not hygienic or proper. Therefore it is recommended that an apron should be built and a cover should be made for the well, there should also be a provision for one fetcher which everybody will used and someone should be assigned to wash the fetcher at the end of each day, in that way some water borne diseases would be prevented and also the distance to the source of water should be made closer to the villagers I.e. the government should make provisions for more sources of water for the rural dwell and also provide central purification board to assist in purifying the water.
It is also recommended that jerry-cans should be used instead of the open container to help in preventing tiny particles. Also iron or metal buckets should not be used because of their ability to react with water after a long time of water being in it.

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APPENDIX

QUESTIONNAIRE ON APPRAISAL OF RURAL WATER SUPPLY AND SANITATION IN SOME SELECTED LOCAL GOVERNMENT AREAS IN KOGI STATE.

Dear Respondent,

This questionnaire is basically for research purpose, whatever answer(s) supplied herein will be treated with confidentiality.

1. NAME OF THE VILLAGE .....

2. Local Government Area.....

3. Population ☐ 1000-5000 ☐ 5000-10000 ☐ 10000-20000 ☐ 20000-Above

4. Respondent occupation..... Farming ☐
Trading ☐
Paid employment ☐
House wives ☐
Artisans ☐

5. What are the prevailing water sources in your community?

☐ Stream ☐ Spring ☐ Well ☐ Vendor ☐ Borehole ☐ Pond ☐ Tap

6. If well, what are the modes of water delivery? ☐ ☐ ☐

Manual Hand pump Electric pump

7. What considerations were made before choosing the source(s) ticked above?

☐ ☐ ☐ ☐ ☐

Proximity Quality Abundance Only choice No reason

8. What is the source of finance for the water projects.

☐ ☐ ☐ ☐ ☐

Government Individual NGO Philanthropist Community effort

9. What group of people is mostly involved in water fetching?

☐ ☐ ☐ ☐ ☐

Adult men Young men Adult women Young women Children

10. Has there been an epidemic of a water-borne disease in your community? ☐ ☐

Yes No

11. If yes, what type of disease? ☐ ☐ ☐ ☐ ☐

Cholera Typhoid Dysentery Guinea worm River blindness , others ☐ please specify

12. What mode of purification do you employ before using the water?

☐ ☐ ☐ ☐ ☐

Boiling Alum addition Filtration Chlorination. None

13. What is the distance to the water source?

☐ ☐ ☐ ☐

<100m 100m-500m >500m-1km >1km

14. What is the average time employed in fetching trip? (Mins.)

☐ ☐ ☐ ☐ ☐

10 30 45 60 above 60

15. What is per capita water consumption (liters)?

☐ ☐ ☐ ☐

>20 10-50 50-100 >100

16. If the water project is being financed by community effort, what is the method of raising money?

☐ ☐ ☐

Taxation Contribution Others (specify)

17. What are the problems encountered in the execution of water projects?

☐ ☐ ☐ ☐

Financial Coordination Deep water table Purification.

18. How are the problems identified in 17 above overcome?

☐ ☐ ☐

Government aid Donor agency others (specify)

19. Where do you place the water while coming from the water source?

☐ ☐ ☐ ☐ ☐

Head Shoulder Motor cycle Bicycle Motor vehicle

20. What types of container are being used to fetch the water?

☐ ☐ ☐ ☐ ☐ ☐

Bucket Jerry cans Drums Clay pot Calabash Gourd

AKAWO O. RHODA

ANALYSIS OF THE QUESTIONNAIRE:

L.G	AVG.POP/ VILLAGE	WATER SOURCE	GROUP INVOLVE	M. O. P	D.T. S O. W (m)	AVG. TIME	TYPE OF CONTAINER
Kabba	20000	Well	Young Women/ Children	Boiling/ Alum	500	10 min.	Bucket/ jerry can
Ijumu	15000	Well/ Borehole	Young men, Women/ Children	Boiling/ Filtration/ None	500	30 min.	Bucket/ jerry Can/ drums
Okene	20000	Well/ Vendor	Young men, Women/ Children	Alum / None	500	30 min.	Bucket/ jerry Can/ drums
Adavi	10000	Vendor/ Borehole	Young men, Women/ children	None	500	30 min.	Bucket/ drum
Dekina	20000	Stream/ Vendor/ borehole	Adult men, Women/ Young Woman/ children	None	1km	60 min.	Bucket/ jerry Can/ drums
Ankpa	20000	Stream	Young men, Women/ children	Boiling/ Alum/ none	750	45 min.	Bucket/ jerry Can

LEGEND:

L.G: LOCAL GOVERNMENT

AVG. POP/ VILLAGE: AVERAGE POPULATION PER VILLAGE

M.O.P: MODE OF PURIFICATION

D.T.S.O.W: DISTANCE TO SOURCE OF WATER

AVG. TIME: AVERAGE TIME